PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| Applicant's or agent's file reference<br>490283 KXR/sdr | **FOR FURTHER ACTION** | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416). |
|---|---|---|
| International Application No.<br>**PCT/NZ2003/000229** | International Filing Date *(day/month/year)*<br>15 October 2003 | Priority Date *(day/month/year)*<br>15 October 2002 |
| International Patent Classification (IPC) or national classification and IPC<br>**Int. Cl.**[7] C12N 15/29, 15/60, 9/88; A01H 5/00 | | |
| Applicant<br>THE HORTICULTURE AND FOOD RESEARCH INSTITUTE OF NEW ZEALANDLIMITED et al | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1 sheet(s).

3. This report contains indications relating to the following items:

   - I [X] Basis of the report
   - II [ ] Priority
   - III [ ] Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV [ ] Lack of unity of invention
   - V [X] Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI [ ] Certain documents cited
   - VII [ ] Certain defects in the international application
   - VIII [X] Certain observations on the international application

| Date of submission of the demand<br>11 May 2004 | Date of completion of the report<br>19 January 2005 |
|---|---|
| Name and mailing address of the IPEA/AU<br>AUSTRALIAN PATENT OFFICE<br>PO BOX 200, WODEN ACT 2606, AUSTRALIA<br>E-mail address: pct@ipaustralia.gov.au<br>Facsimile No. (02) 6285 3929 | Authorized Officer<br>**TERRY MOORE**<br>Telephone No. (02) 6283 2632 |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/NZ2003/000229

## I. Basis of the report

1. With regard to the elements of the international application:*

- [ ] the international application as originally filed.
- [X] the description, pages **1-41,** as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [X] the claims, pages **43-45,** as originally filed,
  pages , as amended (together with any statement) under Article 19,
  pages , filed with the demand,
  pages **42** , received on **19 November 2004** with the letter of **19 November 2004**
- [X] the drawings, pages **1-20,** as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [X] the sequence listing part of the description:
  pages **1-8,** as originally filed
  pages , filed with the demand
  pages , received on with the letter of

2. With regard to the **language,** all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

- [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- [ ] the language of publication of the international application (under Rule 48.3(b)).
- [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- [ ] contained in the international application in written form.
- [X] filed together with the international application in computer readable form.
- [ ] furnished subsequently to this Authority in written form.
- [ ] furnished subsequently to this Authority in computer readable form.
- [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- [X] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages
   - [ ] the claims, Nos.
   - [ ] the drawings, sheets/fig.

5. [ ] This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

INTERNATIONAL PRELIM[redacted]Y EXAMINATION REPORT

[redacted]ational application No.
PCT/NZ2003/000229

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | **1-12 and 19-40** | **YES** |
| | Claims | **13-18** | **NO** |
| Inventive step (IS) | Claims | **1-12 and 19-40** | **YES** |
| | Claims | **13-18** | **NO** |
| Industrial applicability (IA) | Claims | **1-40** | **YES** |
| | Claims | | **NO** |

2. Citations and explanations (Rule 70.7)

The specification describes the isolation, sequencing and characterisation of a polynucleotide sequence encoding apple alpha-farnesene synthase. Alpha-farnesene synthase catalyses the conversion of farnesyl diposphate (FDP) to alpha-farnesene.
The following documents identified in the International Search Report have been considered for the purposes of this report:

D1 JP 2000245482
D2 Vasantha et al (2000) J Amer Soc Hort Sci 125(1), 111-9
D3 WO 1999 015624
D4 WO 2000 017327

Genpept Accession No AAO22848 is not discussed in this report because it was published after the priority date of this application. If the priority date is called into question this document may become relevant to the novelty and inventive step of the claims.

Novelty and Inventive Step

D2 discloses isolation and characterisation of an alpha-farnesene synthase from apple. It appears that this isolated peptide corresponds to the peptide of SEQ ID NO 2 encoded by the nucleic acid of SEQ ID NO 1. As such the citation deprives claims 13-18 of novelty and an inventive step.

In their response the applicant suggested that the citation was not relevant to the claims because the citation did not disclose an "isolated" peptide as defined in the specification. However the citation describes a peptide that has undergone 70 fold purification. This level of purity or isolation appears to be consistent with the definition of "isolated" provided at page 10 of the specification, where it is stated that an isolated peptide is one where the peptide is largely free of at least 50% of the polypeptides from its natural environment.

Furthermore, even if the definition were to be amended to recite higher levels of purity, it is likely that, in the absence of evidence that the peptide in the citation could not be isolated to a higher level of purity as a matter of routine, the claims would still lack an inventive step.

With respect to the remaining claims, claims 1-12 and 19-40, the citation does not suggest further analysis of the peptide sequence or of the gene encoding the peptide. As such the citation does not clearly disclose or teach toward polynucleotides encoding the sequence or genetic constructs expressing the recombinant peptide.

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 1, 13, 19-22, 24-26, 28-33, 38 and 40 are not fully supported by the disclosure in the specification. The specification discloses a specific alpha-farnesene synthase and identifies a sequence motif associated with the activity of the enzyme. As such the specification provides support for this specific sequence and its homologues and for further alpha-farnesene synthases containing the motif identified in the specification. In contrast the claims simply define any alpha-farnesene synthase. As such the claims are not restricted to enzymes and sequences that could be readily obtained or predicted based on the information provided in the specification.

**Supplemental Box**
(To be used when the space in any of the preceding boxes is not sufficient)

**Continuation of Box V2to**

D1, D3 and D4 all disclose synthases that share the motif described by the applicant. However there is nothing in the citations to suggest that these enzymes are able to product alpha-farnesene. In addition, the applicant has also indicated if these enzymes were to use FDP as a substrate it is likely that they would produce beta-farnesene rather than alpha-farnesene. As such, none of these citations appear to disclose or teach toward the claimed invention.

CLAIMS

1. An isolated polynucleotide encoding an *alpha*-farnesene synthase.

2. A polynucleotide as claimed in claim 1 wherein the polynucleotide encodes a polypeptide comprising at least one repeat of DDXXD and LNNDLGTSAAE, wherein X is any amino acid.

3. An isolated polynucleotide as claimed in claim 1 having the sequence of SEQ ID NO:1 or a fragment or variant thereof wherein the fragment or variant encodes encodes a polypeptide with *alpha*-farnesene synthase activity.

4. An isolated polynucleotide as claimed in claim 3 wherein the sequence has at least 70% identity to the nucleotide sequence of SEQ ID NO:1.

5. An isolated polynucleotide as claimed in claim 3 wherein the sequence has at least 90% identity to the nucleotide sequence of SEQ ID NO:1.

6. An isolated polynucleotide as claimed in claim 3 wherein the sequence has at least 95% identity to the nucleotide sequence of SEQ ID NO:1.

7. An isolated polynucleotide as claimed in claim 3 wherein the nucleotide sequence is that of SEQ ID NO:1.

8. An isolated polynucleotide encoding the polypeptide of SEQ ID NO:2 or encoding a variant or a fragment of that sequence which has *alpha*-farnesene synthase activity.

9. An isolated polynucleotide as claimed in claim 8 wherein the polypeptide has at least 70% identity with the amino acid sequence of SEQ ID NO:2.

10. An isolated polynucleotide as claimed in claim 8 wherein the polypeptide has at least 90% identity with the amino acid sequence of SEQ ID NO:2.